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Melon Fly Cooperative Eradication Program

El Monte, Los Angeles County, California

Environmental Assessment, November 1999

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I. Introduction

The melon fly, *Bactrocera cucurbitae* (Coquillett), is native to Asia and is a major pest of agriculture throughout many parts of the world. Commercial and home-grown produce that is attacked by the pest is unfit to eat because the larvae tunnel through the fleshy part of the fruit, damaging the fruit and subjecting it to decay from bacteria and fungi. Because of its wide host range (over 100 species of fruits and vegetables) and its potential for damage, a permanent infestation of melon fly would be disastrous to agricultural production in the United States. In the past, an eradication program was implemented successfully that prevented the pest from becoming established permanently on the U.S. mainland.

II. Purpose and Need

Adult melon flies were detected on November 8 and 15, 1999, in the El Monte Area of Los Angeles County, California. Because of the successive detections of the pest, an infestation of melon fly was determined to exist. This localized infestation represents a major threat to the agriculture and the environment of California and other U.S. mainland States.

The U.S. Department of Agriculture, Animal and Plant Health Inspection Service (APHIS), and the California Department of Food and Agriculture (CDFA) are proposing a program to eradicate that infestation. The eradication zone includes an area of approximately 14-square miles. Although boundaries and the size of the program's proposed quarantine area have not been determined precisely, the area is expected to include sites that are urban, suburban, and rural in nature.

This environmental assessment analyzes the potential environmental consequences of alternatives for an eradication program of melon fly in Los Angeles County, California. APHIS' authority for cooperation in the program is based upon the Organic Act (7 United States Code (U.S.C.) 147a), which authorizes the Secretary of Agriculture to carry out operations to eradicate insect pests, and the Federal Plant Pest Act (7 U.S.C. 150dd), which authorizes the Secretary of Agriculture to use emergency measures to prevent dissemination of plant pests new to or not widely distributed throughout the United States.

III. Alternatives

A. No Action

Under this alternative, APHIS would not participate in efforts to eradicate the existing infestation of the melon fly in Los Angeles County, California. An eradication program could proceed under the direction of the State and/or county governments, but the lack of Federal/State coordination would likely jeopardize timely and efficient implementation of the program. This could result in delays in achieving eradication, expansion of the infested area, and permanent establishment of the melon fly. Potential adverse environmental impacts under this alternative would be at least as severe as those under the proposed integrated program alternative, and would be more severe if the infestation expanded substantially or could not be eradicated. Establishment of melon flies would lead to increased damage to crops and residential produce, uncoordinated use of insecticides by commercial and backyard growers, and increased environmental risk from the insecticide applications. Such adverse effects would be of an indirect, but continuing and escalating nature.

B. Nonchemical Control

Under this alternative, APHIS would participate in a cooperative program to eradicate the existing infestation of melon fly in Los Angeles County, California, with wholly nonchemical methods. Examples of such methods include: sterile insect technique (SIT), physical control, cultural control, and regulatory control. The regulatory control would include commodity treatment methods such as irradiation, cold treatment, and vapor heat treatment. Federal/State approval of such a nonchemical program is unlikely because the program must respond quickly to the infestation to contain and eliminate it before it has the opportunity to spread. Nonchemical methods, such as SIT, have greater effectiveness when used as components of integrated programs, or in preventive programs designed to eliminate pest introductions before they become infestations. The program lacks the capability to produce sufficient quantities of sterile flies to conduct SIT at the present time, but access from other sources (e.g., Japan) could provide enough to release within several months. The potential adverse environmental impacts of a nonchemical program would be expected to be as severe as under the no action alternative, because of the anticipated inability of such a program to quickly and effectively eradicate the infestation. The infestation would grow, resulting in increased damage to crops and residential produce, uncoordinated use of insecticides by commercial and backyard growers, and increased environmental risk from insecticide applications. Such adverse impacts would be of an indirect, but continuing and escalating nature.

C. Integrated Program (Preferred Alternative)

The proposed integrated program would use any or a combination of control methods, based on site-specific requirements that take into account program efficacy and environmental considerations. A form of integrated pest management, integrated control, may include the use of both chemical and nonchemical methods in a timely manner to achieve the program goal of eradication and minimize potential environmental consequences that could arise from program activities. This is the preferred alternative, from both program and environmental perspectives.

Specifically, this integrated program could use any or a combination of the following methods: chemical control, sterile insect technique, physical control, cultural control, and regulatory control. Biological control and biotechnological control also were considered, but have not yet been proven to be efficacious or technologically feasible for this species of pest. The eradication program is expected to concentrate on the use of melon fly male annihilation technique. This involves placement of 1,000 evenly spaced bait stations of Naled/Cue-Lure mixture in trees, shrubs, or other inanimate objects in each core square mile. The core area will consist of 9-square miles and bait stations are serviced at monthly intervals for two life cycles after the last fly find. In addition, the program will consist of ground applications of malathion bait applied to all host plants on properties within a 200-meter radius of each fly find. Diazinon will be drenched with water into the soil within the drip line of plants with fruit known or suspected to contain melon fly larvae. Other anticipated control options include the use of host removal and regulatory control. Regulatory control involves quarantine of fresh produce and commodities from plants that are host to the melon fly. Specific regulatory treatments are required for transport of produce grown within the designated quarantine area to destinations outside this regulated area. The treatment of produce and nursery stock may involve malathion bait spray applications, diazinon soil treatments, methyl bromide fumigations, irradiation treatments, cold treatments, vapor heat treatments, and high temperature forced air treatments.

There are potential adverse environmental impacts from the use of chemicals in the integrated program, but those impacts are fewer and less severe than in the other alternatives. In general, the integrated program would have direct adverse impacts of a non-continuing nature.

IV. Affected Environment and Potential Environmental Consequences

A. Affected Environment

The affected environment includes areas of Los Angeles County, California, that are encompassed by the program's eradication and quarantine zones. The current eradication zone (where eradication treatments will occur) is the area including and immediately surrounding the melon fly detections in the vicinity of El Monte (approximately 14-square miles). This includes section of El Monte, Rosemead, Temple City, Norwood Village, and South San Gabriel. The current quarantine zone (where regulatory treatments may be required) includes the eradication zone and extends farther, for a total area of approximately 81-square miles.

In past fruit fly eradication programs, additional detections occasionally have resulted in program expansion (expansion of eradication and quarantine zones). Minor expansion of the program should not result in the need for further analysis, unless unique and different factors (e.g., endangered or threatened species) are found in the new area. Major expansion of the program area would probably result in the need for additional analysis.

The current program area is urban, suburban, and rural in character. Accordingly, humans, domestic animals, wildlife, and plants may be found in the program area. The San Gabriel River flows through the southwestern corner of the eradication zone. Angeles National Forest is located to the north. Chino Hills State Park is southeast of the program area.

Section 7 of the Endangered Species Act of 1973 (ESA) requires Federal agencies to consult with the U.S. Department of the Interior, Fish and Wildlife Service (FWS) if species listed or proposed for listing are likely to be adversely affected. The CDFA advised that the California Natural Diversity Database indicates that no endangered or threatened species reside within the current eradication zone. However, endangered and threatened species occur in other parts of Los Angeles County. If the program expands into other areas of the county, and if there is a potential for affecting federally listed or proposed endangered and threatened species, APHIS will consult with FWS over protective measures that may be required.

B. Potential Environmental Consequences

The analysis of potential environmental consequences will consider the alternatives of no action, nonchemical control, and an integrated program. Because the principal environmental concern over this program relates to its use of chemical pesticides, this assessment will focus on the potential environmental consequences of the pesticides on human health, nontarget species, and endangered and threatened species.

Consistent with Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," APHIS considered the potential for disproportionately high and adverse human health or environmental effects on any minority populations and low-income populations. The populations within the program area do not differ substantially from residents in other areas of Los Angeles County, but expansion of the program to include additional locations could include areas with higher populations of minority residents or low-income residents. Based upon the expectation of little, if any, expansion of the program area, no disproportionate effects on such populations are anticipated as a consequence of implementing the preferred alternative.

1. No Action

Under the no action (no APHIS effort) alternative, melon fly control would be left to the State, grower groups, or individuals. Without a coordinated efforts between APHIS and cooperators, it is likely that the melon fly infestation would spread to other areas of California and the U.S. mainland. Any response to control such an expanded infestation by individuals or organizations would probably result in a greater magnitude of environmental impact than would be associated with a coordinated APHIS/State eradication program. Under those conditions, any available controls (including more hazardous chemical pesticides) could be used, resulting in greater environmental impact than is associated with the action alternatives analyzed within this assessment.

Private homeowners and commercial growers would have few options other than pesticides to reduce the melon fly damage to their crops. Any pesticides registered for use could be applied in an unsupervised and uncoordinated manner. Accordingly, greater pesticide amounts and higher frequencies of application are likely to be used than would be expected with a coordinated, cooperative government program. In addition to the direct toxic effects of those pesticides, humans could also be affected by cumulative impacts resulting from synergistic effects of combining various pesticides for use against melon fly. Human exposure to pesticides and resulting adverse consequences probably would be greater than if pesticides were applied in a cooperative government program. The spread of the melon fly infestation will reduce the amount of locally available produce and may restrict the fruit consumption of some members of the public. Some members of the public may depend upon this source of fruit as a substantial portion of their diet.

Broader pesticide use resulting from lack of APHIS effort to combat melon fly would increase the pesticide load to the environment and, therefore, increase the probability of effects to nontarget species. The potential expansion and establishment of the pest also would have unknown long-term effects on insect community structure and on predators in those systems.

Further expansion of melon fly's range would be likely to include endangered and threatened species habitats, with unquantified risk to those species from uncoordinated pesticide use. No adverse impacts to endangered or threatened species would result directly from APHIS' implementation of the no action alternative.

2. Nonchemical Control

The nonchemical control methods proposed for use under this alternative include sterile insect technique, physical control, cultural control, cold treatment, irradiation treatment, and vapor heat treatment. Although biological control and biotechnological control are being researched for development, these methods have not yet been proven efficacious or technologically feasible, so their potential environmental consequences are not analyzed.

Human health is not expected to be adversely affected under this alternative. Nonchemical methods such as SIT, physical control, and cultural control do not pose a risk to human health. The control program includes some regulatory treatments (cold treatments, irradiation, and vapor heat treatments) occur in restricted access facilities and are strictly supervised to ensure that no effects occur to human health. In general, the use of nonchemical methods reduces substantially the need for chemical applications, thereby decreasing the magnitude of impact from chemical usage. The nonchemical control alternative, however, may not be successful at eradicating melon fly and the human health consequences of inadequate control could be comparable to the no action alternative if the infestation of melon fly expanded due to insufficient containment of the pest.

The nonchemical techniques that may be employed could disturb nontarget species, due to noise or mere human presence. In general, little risk is associated with these disturbances. SIT could have a positive effect, that of providing a food source to some insectivores. Nonchemical methods have the potential for less pesticide use than the other alternatives, but control and containment by this alternative depend upon low pest populations. If nonchemical methods were insufficient to eradicate a pest population, the ultimate expansion of the infestation could result in pesticide usage comparable to that of no action.

Nonchemical methods should not directly impact endangered or threatened species. The FWS has determined that the sterile insect technique is compatible with endangered or threatened species. The nonchemical regulatory treatments are not made to these species or their critical habitats. Cultural and physical control methods can affect some species through habitat disturbance, but consultation with U.S. Fish and Wildlife Service about the use of these methods within program areas is made prior to program action to ensure that no programs actions will affect the endangered or threatened species or their critical habitat.

3. Integrated Program (Preferred Alternative)

The environmental consequences of nonchemical methods were discussed under the nonchemical control alternative and this information will not be repeated in this section. The components of the proposed program which potentially have the greatest impact on the environment are the chemical pesticides. Special registration procedures are required for pesticides used against exotic pests, such as the melon fly which is not native to this country. A section 18 (emergency) or section 24c (special local needs) exemption under the Federal Insecticide, Fungicide, and Rodenticide Act allows their use. The environmental consequences from the use of these pesticides (malathion, naled, diazinon, and methyl bromide) are discussed below. Because of the limited and restricted nature of these chemical control actions necessary in this program, it has been analyzed within the framework of an environmental assessment.

Three major factors influence the risk associated with pesticide use: fate of the pesticide in the environment, its toxicity to humans and nontarget species, and the exposure of humans and nontarget species to the pesticide. These factors will be evaluated for each of the chemicals analyzed.

a. Malathion Bait Spray

(i) Fate

Malathion is an amber-colored liquid that is combined with a protein bait to form a sticky spray. The formulation used in the program is 0.175 pounds of active ingredient per acre mixed with 9.6 fluid ounces of protein hydrolysate bait per acre, for both aerial and ground applications. The half-life of malathion in soil or on foliage ranges from 1 to 6 days; in water, from 6 to 18 days. Malathion bait spray is applied from the ground, generally as a spot treatment to individual trees, or from the air. Trees, shrubs, and other surfaces such as soil, roads, and ponds are likely to receive spray from aerial applications, although efforts are made to avoid directly spraying water bodies including the use of buffers. Malathion is generally of more concern in aquatic areas because of its high toxicity to aquatic organisms.

(ii) Toxicity

Malathion is an organophosphate that acts by inhibiting acetylcholinesterase. Mildly acutely toxic, malathion is classified by EPA as category III (Caution) based on oral, dermal, and inhalation exposure routes. Toxic effects from malathion may include headache, nausea, vomiting, blurred vision, weakness, and muscular twitching at high doses. In humans and other mammals, metabolism by one degradation pathway leads to the formation of malaoxon, a more potent cholinesterase inhibitor than malathion. The more common degradation pathways yield nontoxic intermediates.

Although malathion has not been determined to be a carcinogen in rats, additional data on malathion and malaoxon are equivocal and studies are ongoing. EPA is currently reviewing the issue. More information is needed to determine the neurotoxicity of malathion (EPA, 1988). Malathion may have synergistic effects when used with other pesticides.

Oral doses of malathion in milligrams per kilogram (mg/kg) are slightly to moderately acutely toxic to mammals and birds (table 1). Signs of poisoning are similar to the reactions of humans. Malathion is highly toxic to some forms of aquatic life, including invertebrates, amphibians, and fish (table 2). The EPA has established a chronic water quality criteria of 0.1 micrograms per liter (µg/L) for protection of freshwater and marine aquatic life. Fish kills that may have been associated with aerial malathion bait spray applications have been documented.

Table 1.
Acute Oral LD_{50}s[1] for Selected Species Dosed with Malathion (mg/kg)

Mouse	720 - 4,060
Female rat	1,000
Male rat	1,375
Mallard	1,485
Pheasant	167

[1]LD_{50} = Lethal dose for 50% of animals treated

Table 2.
Malathion 96-hour LC_{50}s[1] for Selected Aquatic Species (µg/L)

Tadpole	200
Rainbow trout	4.1 - 200
Bluegill	20 - 110
Daphnia	1 - 1.8
Stone flies	1.1 - 8.8

[1] LC_{50} = Lethal concentration for 50% of animals treated

(iii) Exposure and Risk

Human Health

Potential exposure to humans is by dermal absorption, inhalation, or ingestion of residues. Due to the potential for aerial application of malathion bait spray, dermal absorption from direct application or contact with treated surfaces is the primary exposure route for the public. Public exposure from a ground malathion bait spray application will be less than exposure from an aerial application because less area is treated and less pesticide is used. Workers, such as ground applicators and the ground crew for aerial applications, may have inhalation exposure as well as dermal exposure.

Results of the quantitative risk assessment prepared for the Medfly Cooperative Eradication Program Environmental Impact Statement (EIS), whose analysis of malathion impacts also applies to melon fly programs, suggest that exposures to pesticides from comparable program operations are not likely to result in substantial adverse human health effects. Residues on commodities or backyard fruits resulting from the malathion bait spray application are unlikely to greatly increase exposure to the consuming public. Malathion concentrations on vegetation estimated by the California Department of Health Services (Kizer, 1991) indicate that levels of malathion on vegetation are not likely to exceed the residue tolerance levels set by EPA. Residue tolerances for malathion on many food items are established (40 CFR 180.11) and most are 8 parts per million (ppm). The provisional acceptable daily intake is 0.02 mg/kg per day.

The human health risks of comparable treatments are evaluated quantitatively in the Medfly Cooperative Eradication Program EIS. Results suggest that exposure from normal program operations will not present a human health risk either to workers or the public. In addition, risks to humans have been analyzed qualitatively, with reliance on information from past fruit fly eradication programs in California. The exposure scenarios from previous fruit fly eradication efforts will not differ substantially from the current program.

Nontarget Species

Malathion bait spray will kill insects other than the melon fly. Malathion is highly toxic to bees, and direct application to areas of blooming plants can be expected to result in a high bee kill. Although malathion is not phytotoxic, there could be potential indirect effects on plant populations due to lower pollination rates if bee or other pollinator populations are reduced. This is a concern of aerial application. Secondary pest outbreaks have occurred concurrently with the use of aerial applications of malathion bait spray, but have not been determined conclusively to be associated with the applications. In 1981, fish kills also occurred from a similar treatment method. Since then, the State of California has instituted procedures to reduce the likelihood of fish kills. None have been known to occur from aerial applications of malathion bait spray since the procedures were implemented.

Terrestrial animals are exposed to malathion primarily through dermal and oral routes. Ingesting prey containing residues, rubbing against treated vegetation, and grooming contribute to total dose. Aquatic species can be exposed to direct application and runoff. Exposure of malathion bait spray by aerial application poses high risk to nontarget invertebrates and some aquatic species. Some insectivores may be affected. Ground application of malathion bait spray has far fewer environmental consequences because the treated area is smaller and delivery is more accurate. Fewer species would be exposed and thus the treatment poses less total risk to nontarget species than does aerial application.

Endangered and Threatened Species

Although it was determined that no endangered or threatened species reside within the current program eradication zone, several endangered or threatened species are found in other areas of Los Angeles County. If the program were to expand and if the range of federally listed species and the treatment area overlapped, protective measures may be required to protect species from adverse environmental consequences of the program. The species that may be affected by control efforts are dependent upon the control methods used (i.e., not all control methods affect all species equally). Thus, protective measures will vary depending on the control method being used and the species found within the treatment area.

Malathion bait spray is not selective for melon fly alone. Ingestion of bait/malathion and cuticular exposure to malathion by insects other than melon fly could result in their deaths. If their habitats overlapped with the program treatments, those species could be adversely affected by aerial application of malathion bait. Repeated aerial sprays of malathion bait generally would reduce insect numbers. Reduction of insect populations could reduce pollinator species for threatened and endangered plants, and would reduce potential food resources for endangered and threatened insectivores. Malathion is highly toxic to many aquatic species, both vertebrate and invertebrate, and spray drift could result in aquatic system disruption. The ecosystem is resilient enough to absorb some reduction in nontarget populations and the resultant food web effects, but the severity of the reductions would increase with increased applications of malathion. Many of the endangered and threatened species are dependent upon aquatic habitats. Loss of a single individual of a listed species from program activities would be a violation of ESA. Thus, aerial application of malathion bait spray should be controlled both within the range of endangered and threatened insect-pollinated plants (especially annuals) and in aquatic habitats.

b. Naled

(i) Fate

Naled is used with Cue-Lure bait by the program in stations or traps as a melon fly male annihilation technique. Naled is a short residual organophosphate insecticide and acaricide. It is registered for use on various crops and in mosquito abatement programs. Cue-Lure is characterized as safe for human consumption on the U.S. Food and Drug Administration's Generally Regarded as Safe list.

Thorough risk assessments of naled applications have been prepared for potential human health effects (SERA, 1992) and nontarget species effects (USDA, APHIS, 1998). Information from those assessments is incorporated by reference into this document and is summarized here.

The hazards of naled from male annihilation bait stations to environmental quality are minimal. This is primarily a function of the environmental fate properties and limited transport from the bait stations. Any naled that volatilizes to the atmosphere reacts readily with ozone and various hydroxyl radicals (Hazardous Substances Database, 1989). Technical naled (pure) is a solid that is practically insoluble in water. Placement in the bait station makes it unlikely that naled residues would be transferred to soil, water or plants. The half-life of naled is short in soil (8 hours) and water (25 hours). Naled residues persist on vegetation from 4 to 14 days. The rapid breakdown and lack of transport to the environment from the bait stations ensure that there will be no permanent effects on the quality of air, soil, and water for the program applications.

(ii) Toxicity

Naled is an organophosphate insecticide. The toxicity of naled occurs primarily through inhibition of acetylcholinesterase enzyme activity (Smith, 1987). Signs and symptoms of reported human illnesses from exposure to organophosphates include nosebleeds, blurred vision, bronchial constriction, nausea, sweating, dizziness, and muscular weakness.

Acute oral hazards from exposure to naled are moderate. The acute oral LD_{50} of naled to female rats was determined to be 92 mg/kg body weight (EPA, 1988a). The acute dermal LD_{50} to rats was determined to be 800 mg/kg (Gaines, 1969). Skin irritation studies in rabbits indicate that potential for severe erythema and edema. Dermatitis has occurred from some occupational exposures (Edmundson and Davies, 1967).

The chronic study used as the basis for calculation of potential program risk is a 2-year oral exposure study of rats (EPA, 1988a). The systemic NOEL for naled from chronic feeding of rats was determined to be 0.2 mg/kg/day based upon inhibition of brain tissue cholinesterase at 2 mg/kg/day. The regulatory reference value (RRV) for the general public selected for naled based upon this study is 0.002 mg/kg/day. This is based upon applying a safety factor of 10 to make allowance for inter-species variability and an additional safety factor of 10 for intra-species variability and potential for wider ranges in sensitivity in the general public than in the occupational population. The occupational RRV is 0.02 mg/kg/day.

Acceptable studies of the carcinogenic potential of naled have not been evaluated for evidence in humans (EPA, 1991). The lowest reported oncogenic NOEL for naled is 10 mg/kg/day (EPA, 1988a). Since the primary metabolite of naled is dichlorvos (a possible or probable human carcinogen), this metabolite is analyzed when determination of carcinogenic potential of naled is considered. There has also been some evidence of potential mutagenic effects from naled (EPA, 1988a).

The reproductive and fetototoxic NOEL to rats was determined to be 6 mg/kg/day and to rabbits was determined to be 2 mg/kg/day (EPA, 1998a). Reduced fetal weights, decreased survival, decreased litter size, and decreased pup weights were observed at higher exposures.

The primary active ingredient is the parent compound. All other substances in the formulated products of naled are of lower toxicity. Metabolism of naled and dichlorvos (primary metabolite) occurs readily (EPA, 1983).

Acute oral doses of naled are moderately toxic to mammals and moderately to severely toxic to birds (table 3). Naled is moderately to very highly toxic to fish and most aquatic invertebrates, but bait station applications are not expected to result in transport of any residues to water.

Table 3.
Acute Oral LD_{50}s[1] for Selected Species Dosed with Naled (mg/kg)[2]

Rat	92
Mouse	330
Canada goose	36.9
Pheasant	120

[1]LD_{50} = Lethal dose for 50% of animals treated

(iii) Exposure and Risk

Human Health

Potential exposure to humans is by dermal absorption, inhalation, or ingestion of residues. The primary exposure route is through dermal contact with workers who are loading, checking or placing the bait stations in the field. Public exposure from bait stations is rather unlikely due to placement at locations where the public can not easily reach.

Results of the quantitative risk assessment prepared for naled bait stations suggest that potential exposures are not likely to result in substantial adverse human health effects. The margins of safety for most individuals exceed 1,000-fold. The highest potential occupational exposure was determined to occur in the accidental exposure scenario where a worker spills naled solution over both legs. The margin of safety for these program workers is still greater than 10-fold. Exposures to naled for the general public are not expected to occur except in accident scenarios. The margin of safety for this unlikely exposure is greater than 2-fold. No adverse effects are anticipated to human health from naled bait stations, even under extreme or accidental exposure scenarios.

Risks to human health from naled bait spray applications were also analyzed qualitatively for some chronic and subchronic effects. Most of the potential outcomes tested in laboratory tests required much higher exposures than would be anticipated from program applications. Outcomes such as reproductive and developmental toxicity, teratogenicity, and neurotoxicity are highly unlikely to occur from exposures to program applications. Naled is a potential skin sensitizer and other immunotoxic responses could occur if allergic reactions or hypersensitive conditions exist. Based upon experience in past fruit fly programs, it must be kept in mind that the source of any immunotoxic responses to exposure may relate to a reaction to the bait in the formulation rather than the pesticide. The risk of adverse carcinogenic or mutagenic effects is very slight (much less than one in a million) for the potential low exposures from the program use of naled in bait stations.

Nontarget Species

The estimated doses to wildlife are based on the environmental concentrations determined from exposure models and scenarios. These results are described in greater detail in the nontarget risk assessment (USDA, APHIS, 1998b). The exposure of nontarget organisms to naled in bait stations is considerably lower than to bait spray applications or soil drench applications. Only invertebrates that are attracted to and feed upon the naled bait mixture are likely to be affected, but most species are not attracted to the bait. Some flies, plant bugs, ground beetles, ants, and mites are known to be attracted to the bait. Predatory invertebrates in treated areas that feed on attracted species are not expected to have much direct mortality, but their food source could be temporarily diminished. Naled bait mixture is not attractive to honey bees or most invertebrates. Aquatic species are at no risk of adverse effects because residues of naled are not expected to enter water from use in program bait stations.

Endangered and Threatened Species

Although no endangered or threatened species reside within the current program eradication zone, several endangered or threatened species are found in other parts of Los Angeles County. If the program were to expand and if the range of federally listed species and the treatment area overlapped, protective measures may be required to protect species from adverse environmental consequences of the program. The species that could require protection during control efforts are dependent upon the control methods used (i.e., not all control methods affect all species equally). Thus, protective measures will vary depending on the control method being used and the species found within the treatment area.

Naled bait spray is not selective for melon fly alone. Ingestion of naled by insects other than melon fly could result in their deaths. Reduction of insect populations could reduce potential food resources for endangered and threatened insectivores. Naled is not expected to affect any aquatic species or habitats.

c. Diazinon Soil Treatments

(I) Fate

Technical grade diazinon is a sweet, aromatic, amber-brown liquid. The program formulation is applied at a rate of 5 pounds active ingredient per acre. Its half-life in soil ranges from 1.5 to 10 weeks and in water at neutral pH ranges from 8 to 9 days. Small amounts of diazinon are used to treat soil within the drip line of trees that have fruit infested with melon fly larvae. Surface vegetation may retain residues and, depending on soil type, local hydrology, and topography, diazinon may occur in runoff water.

(ii) Toxicity

Although diazinon is widely used and generally is not considered a hazard to human health under its registered uses, it can be toxic to humans. EPA has classified the formulation of diazinon as category II (Warning) for program use in soil treatment. Although not a primary dermal or eye irritant, it can be absorbed through these routes and, at high concentrations or prolonged exposure, causes severe irritation.

The mode of toxic action of diazinon occurs through inhibition of the enzyme, acetylcholinesterase. Symptoms of poisoning in humans, who are much less susceptible to the effects of diazinon than insects, include dizziness, headache, blurred vision, nausea, vomiting, slurred speech, and mental confusion. Death, which can occur from high doses, results from respiratory arrest caused by muscle paralysis and bronchoconstriction. Accidental oral poisonings have resulted in death from doses between 50 and 500 mg/kg.

Diazinon has many metabolites, but toxicity data on most are not currently available. Although the metabolite diazoxon is more toxic than diazinon, it is also more easily metabolized and excreted. Diazinon may exhibit synergistic effects with other commercial pesticide formulations currently in use. Diazinon is not considered to be a carcinogen and is nonmutagenic.

Animals differ in their sensitivity to diazinon, both within and between species. Toxicity varies widely and depends on sex and life stage (table 4).

Diazinon is toxic to vertebrate laboratory animals and very toxic to livestock. Diazinon is extremely toxic to birds, which are sensitive because their blood has no enzymes to hydrolyze diazoxon (a toxic metabolite), as does mammalian blood (Eisler, 1986). Signs of intoxication include salivation, stiff-legged gaits, wing spasms, and wing-beat convulsions (Hudson et al., 1984). Many incidents of avian (particularly geese and other waterfowl) mortality on golf courses have occurred because of the use of granular formulations of diazinon. These incidents led EPA to cancel use of diazinon on golf courses and sod farms in 1986. Some terrestrial invertebrates (such as bees) are extremely sensitive to diazinon. Diazinon causes high earthworm mortality but does not have a similar effect on nematodes.

Freshwater cladocerans (water fleas, common to aquatic areas) are among the aquatic species most sensitive to diazinon; *Gammarus fasciatus* has a 96-hour LC_{50} of 0.20 grams per liter. There is some evidence that juvenile fish are more sensitive than eggs. Sublethal effects include reduced growth and reproduction in both marine and freshwater invertebrates, including reduced emergence of insects (Eisler, 1986). Algae are unaffected by concentrations fatal to aquatic invertebrates.

Table 4.
Acute Oral LD_{50}s[1] for Selected Species Dosed with Diazinon (mg/kg)

Rabbit	130
Mouse	80 -135
Female rat	76 - 250
Male rat	108 - 285
Guinea pig	280
Calf	0.5
Starling	110
Mallard (3 to 4 months old)	3.5
Pheasant (3 to 4 months old)	4.3
Bobwhite quail	3.4 - 10
Chicken (5 days old)	8.4
Redwinged blackbird	2.0
Butterfly	8.8
Honey bee	0.372/bee

[1]LD_{50} = Lethal dose for 50% of animals treated

(iii) Exposure and Risk

Humans

Potential exposure to humans is by ingestion or dermal absorption. The soil drenching application (rate of 52 mg per square foot of treated area) techniques prevent inhalation exposure. Because the diazinon is watered into the soil and the drenched area is small, public exposure will be limited. Program use of the pesticide precludes exposure to residues from produce on host plants because any fruit will be stripped from the plants before treatment. Occupational exposure will be reduced by wearing gloves when handling or applying diazinon. The only human health risk associated with diazinon is the consumption of soil from the drenched area by toddlers. The public will be notified when a drench has occurred and will be advised of the necessary precautions.

Nontarget Species

Diazinon exposure to nontarget organisms is restricted to those organisms that traverse or visit the treated area as well as relatively immobile species that inhabit the area directly treated. The treatments are limited (generally less than 10 gallons per year) and occur only within the drip line of host trees. However, due to diazinon's high toxicity, organisms that are directly exposed are at high risk. Limiting exposure will reduce this risk.

Endangered and Threatened Species

Because birds are highly mobile and are among the most sensitive vertebrates to diazinon, endangered and threatened avian species are of special concern. No endangered or threatened species are known to reside within the current eradication zone. However, if the program were to expand, the limited nature of the soil treatments and implementation of appropriate protective measures would combine to protect federally listed endangered and threatened bird species.

Diazinon is used only to treat soil under hosts that are infested with melon fly larvae and hosts that are in close proximity. This means that very little is used in a program (usually less than 10 gallons annually, for a combined area of under 2 acres). Therefore it is unlikely that endangered and threatened birds would even encounter any treatments.

Endangered and threatened birds may be protected from exposure to diazinon by presence of program personnel who remain in the area until the pesticide has soaked into the soil. Program monitoring may include carcass searches to ensure that no endangered and threatened species are affected by the program. If there is any confirmation that the program has adversely affected an endangered and threatened species, immediate action would be taken to determine an appropriate program response that would be required to protect those species.

It is anticipated that swift initiation of eradication activities upon detection of a melon fly infestation will minimize the area requiring treatment and make it unlikely that treatments will occur where endangered and threatened species are present. The only previous melon fly infestation occurred in urban and suburban areas where natural areas were small and endangered and threatened species were absent. Additionally, the incorporation of protective measures should further protect endangered and threatened species from potential adverse effects attributable to program eradication activities.

d. Methyl Bromide Fumigation

(I) Fate

Methyl bromide is an odorless, colorless, volatile gas which is three times as heavy as air. Its half-life is 3 to 7 days. Methyl bromide is released when a fumigation chamber is aerated. Because methyl bromide is heavier than air, the gas can collect in isolated pockets, which could create hazardous conditions when there is little air circulation or mixing, such as during thermal inversions or periods of low wind.

(ii) Toxicity

Methyl bromide gas and liquid are acutely toxic to humans. Contact with liquid or vapors can cause serious skin or eye injury. Inhalation can cause acute illness, including pulmonary edema (fluid buildup in the lungs), gastrointestinal distress, and convulsions which can be fatal. The LD_{50} (lethal dose for 50% of animals treated) of rats to methyl bromide is 2,700 ppm for a 30-minute exposure. In humans, 1,583 ppm (6.2 mg/L (milligrams per liter)) methyl bromide is lethal after 10 to 20 hours of exposure and 7,890 ppm (30.9 mg/L) is lethal after 1½ hours of exposure (EPA, 1986). EPA has derived an RfC (reference concentration) of 0.48 milligrams per cubic meter (mg/m^3) for general population exposure to methyl bromide (EPA, 1992).

Methyl bromide is rapidly absorbed by the lungs and affects both the lungs and kidneys. Increased exposure to methyl bromide results in elevation of bromine levels in the blood; poisoning symptoms occur at a level of 2.8 mg/100 ml of blood

(Curley, 1984). Symptoms of acute exposure typically are headache, dizziness, visual problems, gastrointestinal disturbances, and respiratory problems. In more extreme cases, muscular pain, numbness, or twitching precede convulsions, unconsciousness, and possibly death.

Chronic exposure can result in behavioral changes, loss of ability to walk, neurological damage, and renal and liver function disturbances (Verberk et al., 1979). Because there are a number of toxicity data gaps, the chronic and subchronic toxicity of methyl bromide is not well characterized. For this reason, and the implication of its contribution to ozone depletion, EPA has issued a call-in notice to provide this information for reregistration. Manufacturers must supply more information.

Based on laboratory studies of the effects of methyl bromide inhalation and ingestion, nontarget species of mammals and birds exhibit symptoms similar to humans: weakness, lack of muscular coordination, neurological and behavioral abnormalities, and death from high doses. Due to its restricted use as a fumigant, wild animals are rarely exposed to methyl bromide and toxicity data is limited to farm animals. Residues in hay ranging from 6,800 to 8,400 ppm caused symptoms of intoxication in cattle, horses, and goats (Knight and Costner, 1977).

(iii) Exposure and Risk

Humans

Inhalation is the primary exposure route for methyl bromide. Concentrations of methyl bromide are electronically monitored during the fumigation. Because the gas is odorless and nonirritating during exposure and the onset of symptoms is delayed, leaks and spills causing extreme exposure can occur without persons being aware of its presence. Protective clothing and self-contained breathing apparatus are worn whenever concentrations of methyl bromide are anticipated to reach or exceed 5 ppm. The American Conference of Governmental Industrial Hygienists (ACGIH) has established exposure standards (Threshold Limit Value) of 5 ppm (20 mg/m^3) to protect against adverse neurotoxic and pulmonary effects (ACGIH, 1990). Dermal exposure to workers could occur in the unlikely event of a spill of liquid methyl bromide.

Ingestion of methyl bromide residues and its degradation products is a third exposure route. Following aeration of the commodity, the small amount of methyl bromide that remains dissipates and degrades, leaving only inorganic bromide residues. However, residues from the methyl bromide fumigation will remain on the commodity. EPA tolerances for residues of methyl bromide, measured as inorganic bromides (40 CFR 180.123), range from 5 ppm (for apples, pears, and quinces) to 240 ppm (for popcorn), with most commodities at 50 ppm or less. Ingestion of these small amounts of residues is considered to have no toxicological effect.

The Natural Resources Defense Council previously petitioned EPA to classify methyl bromide as a class I ozone depleting chemical; the petitioners also requested reduction of its manufacture by 50% in 1992, and complete elimination of manufacture by January 1, 1993. EPA is expected to require the phase-out of most uses of methyl bromide by 2005. The relative importance of methyl bromide to ozone depletion, however, is subject to fundamental uncertainties.

Workers will have little exposure to methyl bromide because fumigations are contained. The public will be restricted from access to the fumigation chamber by a 30-foot wide barrier zone. Residues in fumigated commodities will be within tolerance limits. There is very little risk to human health from a methyl bromide fumigation.

Nontarget Species

Few nontarget species will be exposed to methyl bromide directly. The aeration duct will deliver a plume which will disperse quickly. Species within this plume, such as insects which inadvertently fly in, might die. However, these effects are restricted to areas within the 30-foot wide barrier zone (Bergsten, personal communication). In addition, ground-dwelling organisms immediately outside the fumigation chamber are not anticipated to survive.

Endangered and Threatened Species

Fumigation chambers are generally located in high traffic areas; tarped fumigations occur in agricultural areas. These areas are highly disturbed and are very unlikely to harbor endangered and threatened species. Therefore, it is not likely that endangered or threatened species will be exposed to methyl bromide fumigation.

e. Cumulative Impacts

Cumulative impacts are those impacts, either direct or indirect, that result from incremental impact of the program action when added to other past, present, and reasonably foreseeable future actions. It is difficult to quantitatively predict the cumulative impacts for a potential emergency program in an environmental assessment such as this. The impacts can be considered from a subjective perspective.

Some chemicals, when used together, have been shown to act in a manner that produces greater toxicity than would be expected from the addition of both. This effect is known as potentiation or synergism. Malathion bait spray, naled bait stations, and diazinon could be applied during the same treatment regimen. Because malathion has frequently been observed as one constituent of a potentiating pair of organophosphorus insecticides (Murphy, 1980), synergistic effects from the combination of malathion and other organophosphorus insecticides could occur. However, malathion bait spray is applied to the tree canopy, naled is in bait stations, and diazinon is applied to the soil within the drip line of the canopy, so synergistic effects are limited to animals that are active at more than one site of application. In addition, the restriction of diazinon treatments to plants with infested fruits make it unlikely that any animals would get concurrent exposures.

Impacts from implementation of the program are expected to be temporary with potential adverse effects ending shortly after the infestation is eradicated. No bioaccumulation or environmental accumulation of malathion, diazinon, or naled is foreseen due to rapid degradation rates. In contrast, the ongoing applications expected from the no action alternative would be expected to have cumulative effects. Therefore, any cumulative impacts of the program are expected to be less than those that might occur under the no action alternative, an alternative which most likely would result in escalating use of pesticides by the public.

Because the eradication may require the simultaneous use of organophosphate cholinesterase inhibitors, there could be cumulative effects. The history of the eradication efforts for the melon fly, as well as other fruit fly species, shows that this use pattern does not result in adverse effects to the general resident population nor the workers. Because most nontarget species are mobile, it is unlikely that an individual will be exposed to more than one treatment. In addition, diazinon treatments are restricted to locations where melon fly larvae are detected. Domestic animals and less mobile organisms, such as those dwelling near the soil surface, could be exposed.

In terms of the cumulative effects of pesticide use from the proposed action with pesticide use from other fruit fly programs, the small area requiring treatment for this program should not substantially increase exposure to workers, public, or nontarget species.

f. Methods to Reduce Risk

Human pesticide exposure would be primarily to workers, especially in the case of the soil drench pesticide, diazinon, or methyl bromide which is used only in certified fumigation chambers or under tarpaulins (enclosures). Residents within the eradication area will be exposed to malathion bait spray and diazinon to an extent depending on where the pesticides are applied. The public could be exposed to residues on any treated material moved out of the eradication area. The bait stations treated with naled are placed outside the reach of the public and exposures are unlikely unless an individual makes a special effort to disturb the contents.

Current worker safety measures protect fumigators and other pesticide applicators from excessive exposure to methyl bromide, diazinon, malathion, and naled during routine operations. To minimize worker exposure to methyl bromide, the fumigation chamber is opened only after concentrations are reduced below 5 ppm. Proper sealing of fumigation enclosures and proper aeration facilitates dispersal of the fumigant. Diazinon exposure of workers can be prevented by gloves and safety goggles, which are indicated as protective clothing requirements on the label (Meister, 1990). Studies on exposure to diazinon during yard applications reveal that 85% of the exposure to workers is to their hands. Dermal exposure of workers to malathion and naled can also be substantially reduced by the use of protective clothing.

Written public notification will provide information about the schedule for pesticide treatments and applications, and specific precautions that residents should take to avoid excessive exposure, such as remaining indoors during malathion bait spray applications or diazinon soil treatments, and that malathion-treated produce should not be harvested for 3 days after application. However, individuals with greater sensitivity to cholinesterase inhibitors or the protein bait may need to take extra precautions to avoid even minimal exposure.

The program, properly implemented, represents a relatively low risk to human health except for extremely sensitive individuals who have had problems with similar programs in the past. However, this assessment does contain uncertainties associated with toxicity data gaps and estimations of exposure. Furthermore, synergistic interactions between the pesticides which could be used in this program, as well as other pesticides not associated with the program and possibly used in the same area, could increase toxicity and the associated risk. Potential risk will be substantially diminished due to the localized nature and short duration of the program.

Risks to nontarget organisms can be reduced by limiting exposure. If aerial applications are conducted, beekeepers and backyard pond owners should be notified. A survey of water bodies within the treatment area should be conducted and mapped so they will be avoided by establishing “no treatment” zones during aerial operations. Ground application of malathion bait spray poses little direct risk. Pet owners should be notified to limit animals’ exposure to treated trees. Soil treatments pose more risk due to higher toxicities and a barrier or other safeguards should be used. Timing of the treatment should be considered to reduce exposure. Standard operating procedures for methyl bromide fumigations include fencing or other barriers to limit access to fumigation and aeration area, which precludes exposure of many vertebrates.

The FWS or the California Natural Diversity Data Base will be consulted if the program area is expanded to ensure that endangered or threatened species are not adversely impacted.

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Appendix B. Consultation

The following agencies were consulted during the preparation of this environmental assessment:

California Department of Food and Agriculture
Department of Plant Industry
Sacramento, California

U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine
Program Support
Riverdale, Maryland

U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Policy and Program Development
Environmental Analysis and Documentation
Riverdale, Maryland

Finding of No Significant Impact
for
Melon Fly Cooperative Eradication Program
El Monte, Los Angeles County, California
Environmental Assessment,
November 1999

The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), has prepared an environmental assessment (EA) that analyzes potential environmental consequences of alternatives for eradication of the Melon fly, an exotic agricultural pest that has been found in the El Monte area of Los Angeles County, California. The EA, incorporated by reference in this document, is available from—

U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine
Western Regional Office
9580 Micron Avenue, Suite 1
Sacramento, CA 95827

or

U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine
Program Support
4700 River Road, Unit 134
Riverdale, MD 20737-1234

The EA analyzed alternatives of (1) no action, (2) nonchemical control, and (3) integrated program (the preferred alternative). Each alternative was determined to have potential environmental consequences. The integrated program was preferred because of its capability to achieve the eradication objective in a way that reduces the magnitude of those potential environmental consequences. Program standard operational procedures and mitigative measures serve to negate or reduce the potential environmental consequences of this program.

APHIS has determined that there would be no signficant impact to the human environment from the implementation of an integrated program, the preferred alternative. APHIS' Finding of No Significant Impact for this program was based upon the limited nature of the program and its expected environmental consequences, as analyzed in the EA. In addition, APHIS anticipates no adverse impacts to threatened or endangered species or their habitats from this regulatory action. I find that the integrated program alternative poses no disproportionate adverse effects to minority and low-income populations and the actions undertaken for this program are entirely consistent with the principles of "environmental justice," as expressed in Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations."

Lastly, because I have not found evidence of significant environmental impact associated with the proposed program, I further find that an environmental impact statement does not need to be prepared and that proposed integrated program may be implemented.

/s/ _____________________________ 11/29/1999 __________

Helene Wright
State Plant Health Director - California
Plant Protection and Quarantine
Animal and Plant Health Inspection Service

Date